122804
SHAUGHNESSY NO.

REVIEW NO.

EEB REVIEW

DATE: IN 8/14/85 OUT OCT 28 1985

FILE OR REG. NO. 50658-EUP-001

PETITION OR EXP. PERMIT NO.

DATE OF SUBMISSION 7/25/85

DATE RECEIVED BY HED 8/14/85

RD REQUESTED COMPLETION DATE 10/31/85

EEB ESTIMATED COMPLETION DATE 10/24/85

RD ACTION CODE/TYPE OF REVIEW 714

TYPE PRODUCT(S): I, D, H, F, N, R, S Miticide

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. G. LaRocca (15)

PRODUCT NAME(S) Abamectin

COMPANY NAME Merck & Company, Inc.

SUBMISSION PURPOSE Proposed revisions in EUP for review by EEB

SHAUGHNESSY NO.	CHEMICAL & FORMULATION	% A.I.

ECOLOGICAL EFFECTS BRANCH

REVIEW

Avermectin

100 Experimental Label Information

100.1 Pesticide Use

Miticide/Insecticide for experimental use on citrus.

100.2 Formulation Information

Active Ingredient

Abamectin: Avermectin B_1 [A mixture of avermectins containing $\geq$ 80% avermectin A_1a, 5-0-demethyl-and $\leq$ 20% avermectin B_1a, 50-demethyl-25-de(1-methylpropyl)-25(1-methylethyl)	2.0%
Inert Ingredients	98.0%

(1 gallon contains 0.15 pound abamectin)

100.3 Application Methods, Directions, Rates

DIRECTIONS FOR USE

Use of this pesticide in any manner inconsistent with the terms of the Experimental Use Permit is a violation of Federal Law.

To evaluate the effects of this product on citrus rust mite, citrus red mite, citrus flat mite, citrus broad mite, citrus bud mite, Yuma spider mite, Texas citrus mite, and other arthropod pests of citrus, apply either as a single spray or in a full season program at the rates given in Table 1. Evaluate applications in 100 to 1000 gallons of water per acre using standard ground equipment designed to deliver accurate sprays. All applications should be made with 0.20 to 0.25 percent oil in the spray mixture or with a minimum of 1.0 gallon of oil per acre.

Table 1. Rates to be Evaluated in the Experimental Program

Crop	Pests	For Concentrate Sprays MK-936 0.15 EC Per Acre	For Dilute Sprays MK-936 0.15 EC Per 100 Gal	Pounds Active Ingredient Per Acre
Citrus (round orange, grapefruit, lemon, lime and mandarine types)	Citrus rust mite	1/3 - 1 1/3 pints	1.05 - 2.1 fl oz	0.00625 - 0.025
	Citrus broad mite			
	Citrus red mite			
	Citrus flat mite			
	Texas citrus mite			
	Citrus bud mite	2/3 - 1 1/3 pints	2.1 fl oz	0.0125 - 0.025
	Yuma spider mite			
	Citrus thrips			

Remarks

a/ Do not apply more than 1000 gals. dilute spray per acre.
b/ For concentrate sprays - adjust the dosage to apply an amount not exceeding that used in a dilute spray.
c/ Do not apply within 7 days of harvest in FL and TX and 14 days of harvest in CA and AZ.
d/ Do not apply more than 3 sprays in any 12 month period.

Spray Intervals

In single applications, evaluate at a rate given in table 1 to determine the dose needed to give residual control of the target pest indicated. To determine the effects of multiple applications on the total arthropod complex and fruit quality, evaluate a maximum of 3 applications within the rate ranges in full season programs with applications made postbloom (spring), summer and/or fall.

100.4 Target Organisms

Mites

100.5 Precautionary Labeling

ENVIRONMENTAL HAZARDS

This product is toxic to fish and wildlife. Keep out of lakes, ponds, or streams. Do not contaminate water by cleaning of equipment or disposal of wastes.

Do not apply when weather conditions favor drift from target areas.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

In order to ensure protection of endangered species from exposure to this experimental pesticide, persons authorized to conduct experiments with this product must first consult with State or Federal endangered species authorities responsible for the treatment area.

100.6 Proposed EUP Program

100.6.1 Objectives

To determine efficacy of avermectin in controlling citrus mites.

100.6.2 Date, Duration

January 1, 1986 to December 31, 1986.

100.6.3 Amount Shipped, Geographical Distribution

States, Acreages, and Quantity of Material for Proposed Experimental Use of MK-936 on Citrus in 1986

State	Acreage	Range of Rates to be evaluated (lbs ai/A)	Maximum number Application	Maximum Quantity of MK-936 0.15 EC Needed (Gallons)
California	1,500	0.00625-0.025	3	750
Arizona	500	0.00625-0.025	3	250
Florida	1,800	0.00625-0.025	3	900
Texas	200	0.00625-0.025	3	100
	Total 4,000 Acres			2,000 gal*

* For purpose of calculating the quantity of material needed, the maximum rate within the range (0.025 lb ai/A) was used. A total of 2000 gallons of MK-936 0.15 EC (300 lbs ai) is requested for use on a maximum of 4000 acres of citrus treated three times. This figure, therefore, represents an absolute maximum because it assumes that all acreage would be treated and the total acreage would receive three applications at the maximum rate.

Locations of Test Sites in Proposed Experimental Programs:

All citrus producing counties in the States of California, Arizona, Florida, and Texas are to be included.

101 Hazard Assessment

101.1 Discussion

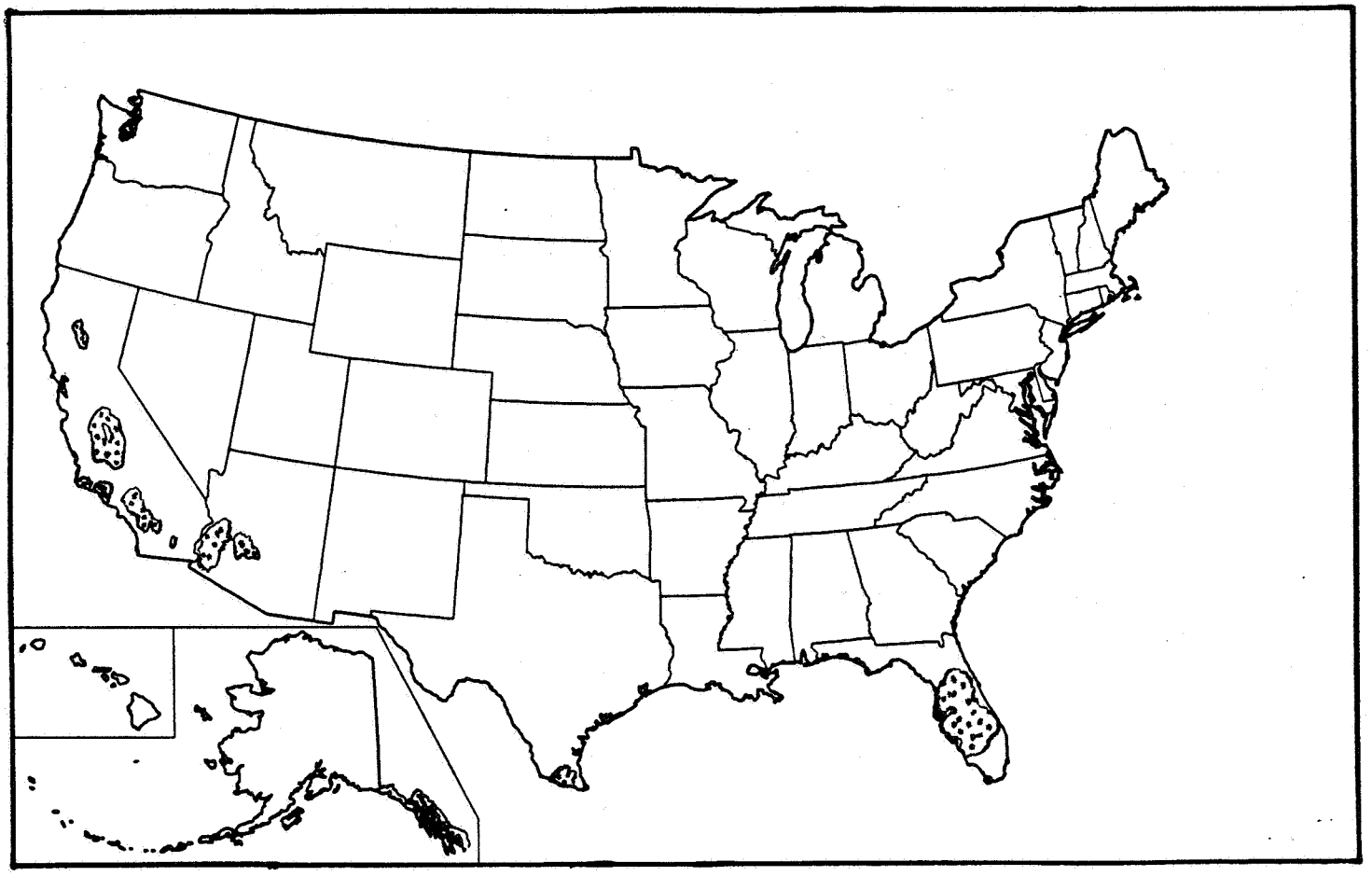
The maximum application rate is 0.025 lbs ai per acre with a maximum number of applications at three per season. Timing is postbloom (spring), summer and/or fall. Aerial or mist treatment is assumed.

Citrus is grown in central Florida, southern Texas Western Arizona, and central-south California. See figure 1.

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Avermectin is very highly toxic to fish (Rainbow trout LC_{50} = 3.2 ppb; Bluegill LC_{50} = 9.6 ppb) and daphnids (LC_{50} = 0.34 ppb). It is very highly toxic

5



citrus growing areas

Figure 1 Citrus growing areas in United States.

to shrimp (mysid LC_{50} = 0.2 ppb) and estuarine fish (Sheepshead minnow LC_{50} = 15 ppb), and highly toxic to oysters (eastern oyster EC_{50} = 430 ppb). It is practically nontoxic to bobwhite quail (LC_{50} = 3102 ppm; LD_{50} > 2000 mg/kg) but is moderately toxic to mallard duck (LD_{50} = 85 mg/kg). It is highly toxic, to very highly toxic to mammals (mouse LD_{50} = 13 to 23 mg/kg; rat LD_{50} = 10 to 11 mg/kg; weanling rat LD_{50} = 1.5 mg/kg). It has an effect on reproduction in rats at 0.1 to 0.5 mg/kg/day.

Avermectin is relatively persistent in soil (t 1/2 = 4 to 10 weeks). It does not hydrolyze but photolyzes in aqueous solution. Photolytic half-life in water and on surfaces is 12 to 24 hours. Bioaccumulation is minimal; maximum is 110X in fish viscera. Deparation 95 percent in 2 weeks.

The solubility of avermectin is 10 ppm.

Aquatic Exposure

Direct application to water is not expected, therefore, transport to water would only occur through drift or runoff.

Drift could result in the following residues immediately after treatment.

Depth	
3 feet	6 feet
0.3 ppb	0.15 ppb

Because of its relatively low solubility, runoff should be small, i.e., less than 1 percent. In the following scenario, 10 acres drains into a 1 acre pond 6 feet deep.

```
 0.025 lbs ai/acre
x  10  acres
  0.25 lbs
 x0.01 1% runoff
0.0025
 x  61 ppb (1 lb into 6' of water)
  0.15 ppb
```

So the immediate maximum expected residues in a pond adjacent to a treated citrus grove could reach 0.3 ppb (0.15 + 0.15 = 0.3 ppb).

7

This exceeds the mysid shrimp LC_{50} and approaches the Daphnia magna LC_{50}. It is expected that the experimental use of Abamectin on citrus groves adjacent to water could have an adverse acute effect on aquatic or estuarine invertebrates. The expected residues do not exceed the fish LC_{50} or the oyster larvae EC_{50}. This proposed EUP is not expected to have an acute effect on fish or molluscs. Note that the expected residue is calculated for standing water. Moving water would dilute this substantially to below adverse effect levels.

Avermectin is not expected to have a chronic effect because it would photolyze rapidly in water. Furthermore, residues from multiple treatments would not accumulate if the applications were more than a week apart.

Terrestrial Exposure

At the proposed rate of application, 0.025 lbs ai per acre, the following residues (ppm) on terrestrial food items are expected.

	short grass	long grass	leafy crops	insects forage	seed pods	fruit
maximum	6	2.8	3.1	1.5	0.3	0.2
typical	3.1	2.3	0.9	0.8	0.1	<0.1

These levels are below the avian LC_{50} and as such should not cause an adverse acute effect to birds.

Table 2 shows a number of mammalian species, their weights, food consumption, and extrapolated LC_{50}'s. The extrapolation used the rat LD_{50} of 10 mg/kg. The above residues are lower than the lowest calculated LC_{50}. This EUP should not have an adverse acute effect to mammals.

Avermectin degrades rapidly (t 1/2 < 12 hrs) on surfaces exposed to light. It should not cause an adverse chronic effect to mammals.

Summary

This proposed EUP may cause acute adverse effects to estuarine/aquatic invertebrates in shallow (< 6') standing or slow-moving water adjacent to citrus groves treated with avermectin. It should not cause acute effects to fish or molluscs nor should it cause chronic effects. This EUP is not expected to cause adverse acute or chronic effects to birds or mammals.

3

Table 2. Table Of Mammalian Food Consumption [1/]

SPECIES [2/]	BODY WEIGHT GRAMS	DAILY FOOD INTAKE GRAMS	DAILY FOOD INTAKE GRAMS/G [3/]	LC_{50} PPM = $\frac{LD_{50} \times \text{ANIMAL WT}}{\text{FOOD CONS PER DAY}}$
Grazing Herbivores				
Meadow vole	46	28.1	0.61	16.4
Hispid cotton rat	100	31.2	0.31	32.1
Eastern Cottontail	312 [4/]	224	0.72	13.9
Swamp Rabbit	1518	641	0.43	23.7
Jack Rabbit	2043	80	0.04	255.4
Beaver	12998	393	0.03	330.7
Deer	24970	606	0.02	412.0
Cow	181600	4994	0.03	
Granivores				
Old field mouse	13	2.1	0.16	62.0
Red squirrel	190	13.4	0.07	141.8
Fox squirrel	1000	38	0.04	263.1
Omnivores				
House mouse	19	7.6	0.40	25.0
Deer mouse	18.4	3.6	0.20	51.1
Whitefooted mouse	26.1	4.3	0.16	60.7
Marsh rice rat	37	1.7	0.04	217.6
Raccoon	18160	385	0.02	47.2
Insectivores				
Masked shrew	3.4		2.8	
Least shrew	5.0	5.5	1.1	9.1
Water shrew	10.0	10.3	1.0	9.7
Short-tailed shrew	24		0.53	
Common mole	46.5	28.7	0.62	16.2
Carnivores				
Least weasel	60	15	0.25	40.0
Long-tailed weasel	230	49	0.21	153.0
Bobcat	10090	1000	0.10	100.9

1/ Table copied from Davis, D.E. and F.B. Golly, 1963. Principles of Mammalogy. Reinhold Publ. Corp. N.Y.

2/ In original table, scientific names only were provided.

3/ When multiplied by 100, yields percent of body weight one animal could consume in one day.

4/ This is low for a rabbit weight, but it is what was in the original table.

101.3 Endangered Species

This EUP should have no adverse effect on endangered bird or mammal species either because of low use levels or lack of exposure potential.

This EUP may have an adverse effect on endangered fish exposed to runoff or drift from treated citrus groves.

EEC = 0.3 ppb
Trigger (fish) = 3.2/20 = 0.16 ppb

The following endangered fish species were listed in the March 27, 1985 review by J. Bascietto.

Bonytail Chub (Gila elegans)
Colorado River squawfish (Ptychochelius lucius)
Gila topminnow (Poeciliopsis o. occidentalis)
Woundfin (Plagopterus argentissimus)
Gila trout (Salmo gilae)
Unarmored threespine stickleback (Gasterosteus aculeatus Williamsoni)
Little Kern Golden Trout (Salmo aquabonita whitei)
Shortnose Sturgeon (Acipenser brevirostrum)
Apple snail* (Pomacea paludosa)

*The apple snail is not endangered but is the sole food source for the Florida Everglades kite. A threat to this snail is an indirect threat to the endangered kite.

However, further research revealed mitigating information. The Bonytail chub once occurred throughout the Colorado River basin. It is presently only known from the upper Colorado and Green Rivers in Utah and Colorado (not in Arizona). The Colorado River squawfish may occur in the Colorado River basin in Arizona but it is a deep water fish and residues in deep flowing water would be miniscule. The Gila topminnow occurs in headwater streams at high elevations where no agriculture takes place. The Gila trout occurs (in Arizona) in the Verde River basin. This is an introduced population which is in a pinyon-junipa area. No citrus adjacent to habitat. (See phone conversation with Bill Silvey, Arizona Game & Fish in Gila Trout file). The Little Kern Golden trout occurs entirely within the Sequoia National Forest. The shortnose sturgeon occurs in large tidal rivers where dilution would likely reduce residues to no levels having no adverse effect.

This leaves the Woundfin, Unarmored threespine stickleback and the apple snail as species possibly threatened by this EUP.

However, the label statement is still required and the EUP participants must ensure, through contact with U.S. Fish and Wildlife Service, Office of Endangered Species personnel, that their application of avermectin would not affect endangered aquatic species.

In addition to the endangered fish species, the following endangered insect species may be exposed to drift from citrus treatment.

Species	Location
Smith's Blue Butterfly	Santa Cruz and Monterey Counties, CA along the coast.
Kern Primrose Sphinx Moth	Kern County, CA
Valley Elderberry Longhorn beetle	Yolo, Sacramento, and Solaro Counties, CA

101.4 Adequacy of Toxicity Data

The available data were adequate to complete this hazard assessment. No new data were submitted with this review. The necessary estuarine tests are included with the fire ant review.

101.5 Adequacy of Labeling

The labeling is adequate as it is.

102 Conclusions

EEB has completed an assessment of this proposal to experimentally use avermectin on citrus. Based on available data, EEB concludes that this EUP will cause minimal adverse effects to fish, molluscs, bird, mammals, and other terrestrial nontarget organisms. However, in slow moving, shallow water adjacent to treated citrus groves aquatic invertebrates may experience adverse acute effects. Endangered fish and insect species should not be adversely affected provided the EUP participants follow the environmental hazard label directions.

//

Daniel Rieder 10/29/85
Daniel Rieder
Wildlife Biologist, Section 2
EEB/HED

Norman Cook 10.31.85
Norm Cook
Section Head, Section 2
EEB/HED

Michael Slimak 11/4/85
Michael Slimak
Chief
EEB/HED